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(52) UK CL (Edition O )

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(56) Documents Cited

**GB 2222534 A**

**GB 1604832 A**

**GB 0843990 A**

**GB 0843237 A**

**GB 0841603 A**

(58) Field of Search

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**DNRF**

**INT CL<sup>6</sup> B01D 35/14 35/30**

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## (54) Filter assemblies

(57) The filter assembly comprises a base member (10), a filter element (11, 40) mounted on the base member (10) and a housing (12, 41) connected to the base member (10) so as to enclose the filter element (11, 40). Means (29, 31, 37, 60, 80, 83) are provided for connecting the filter element (11, 40) to the housing (12, 41) so that the filter element (11, 40) is retained with the housing (12, 41) when the housing (12, 41) is removed from the base member (10) on disassembly. The connecting means (29, 31, 37, 60, 80, 83) are such that rapid and simple removal of the filter element (11, 40) from the housing (12, 41) can be achieved by pulling the element (11, 40) from the housing (12, 41).

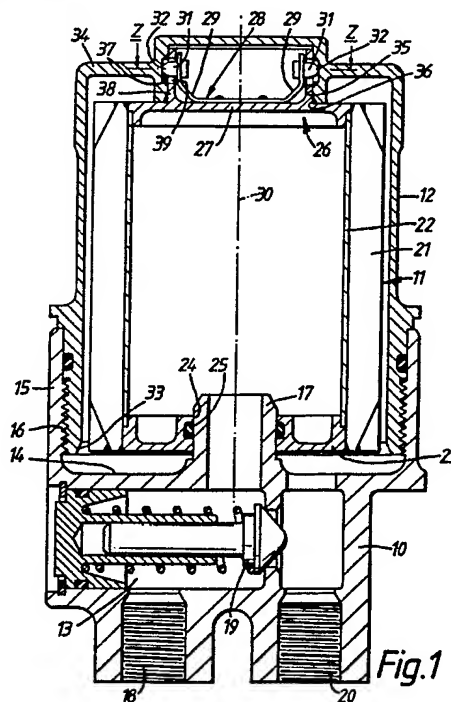


Fig.1

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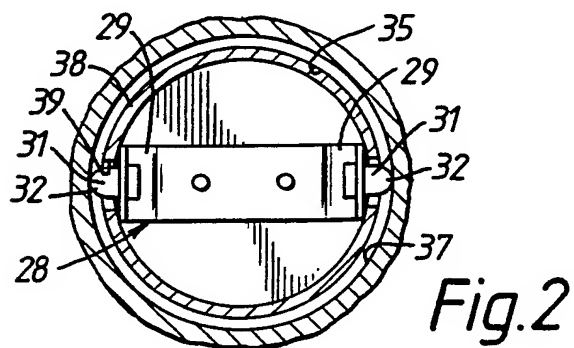
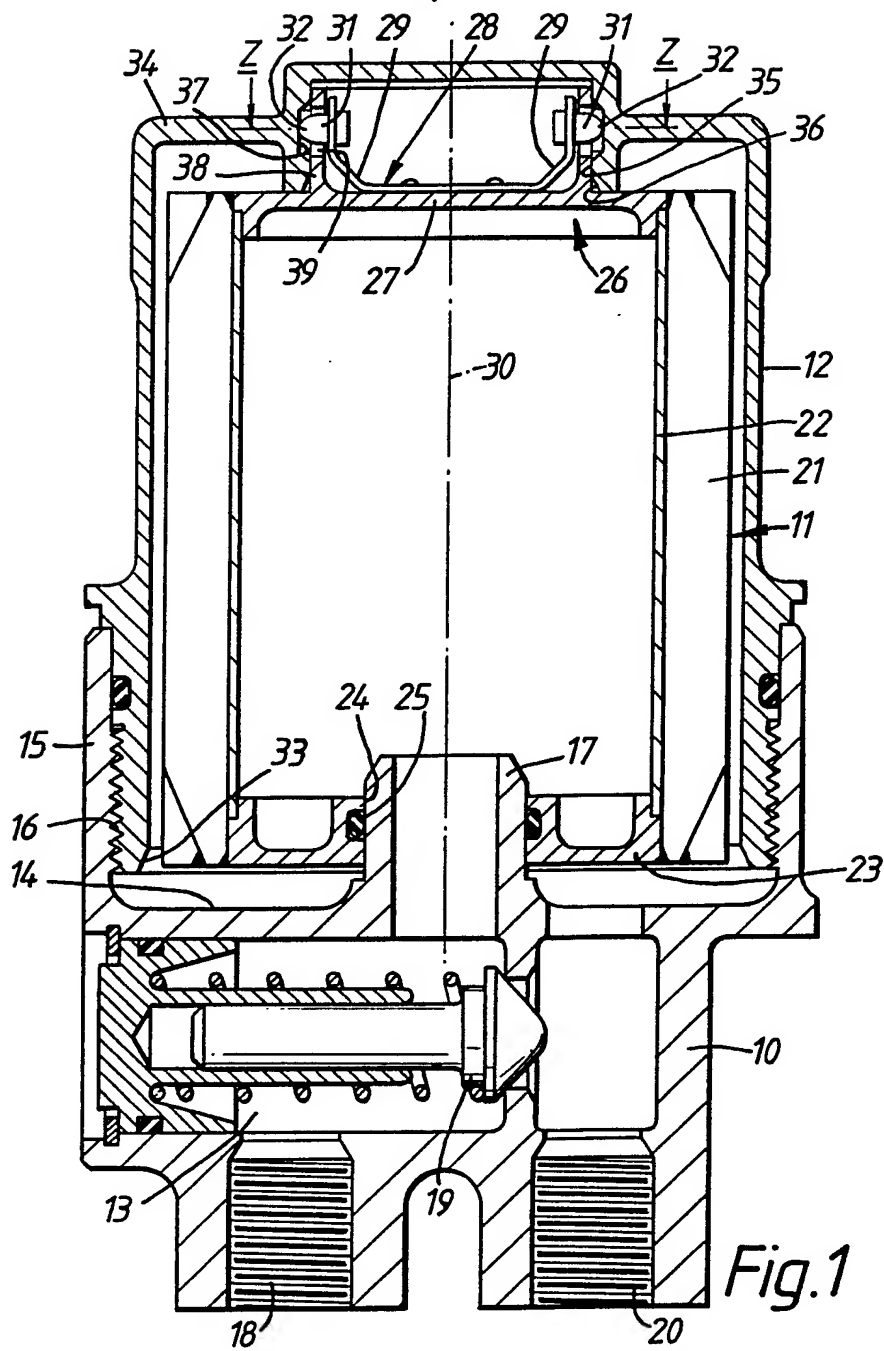
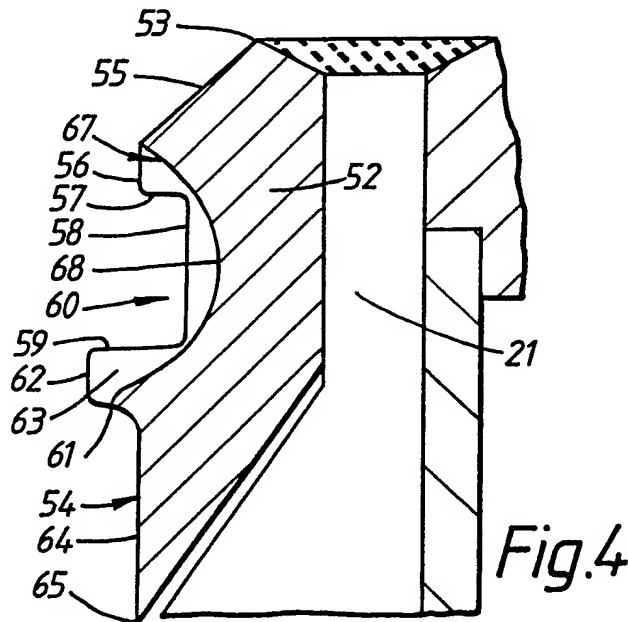
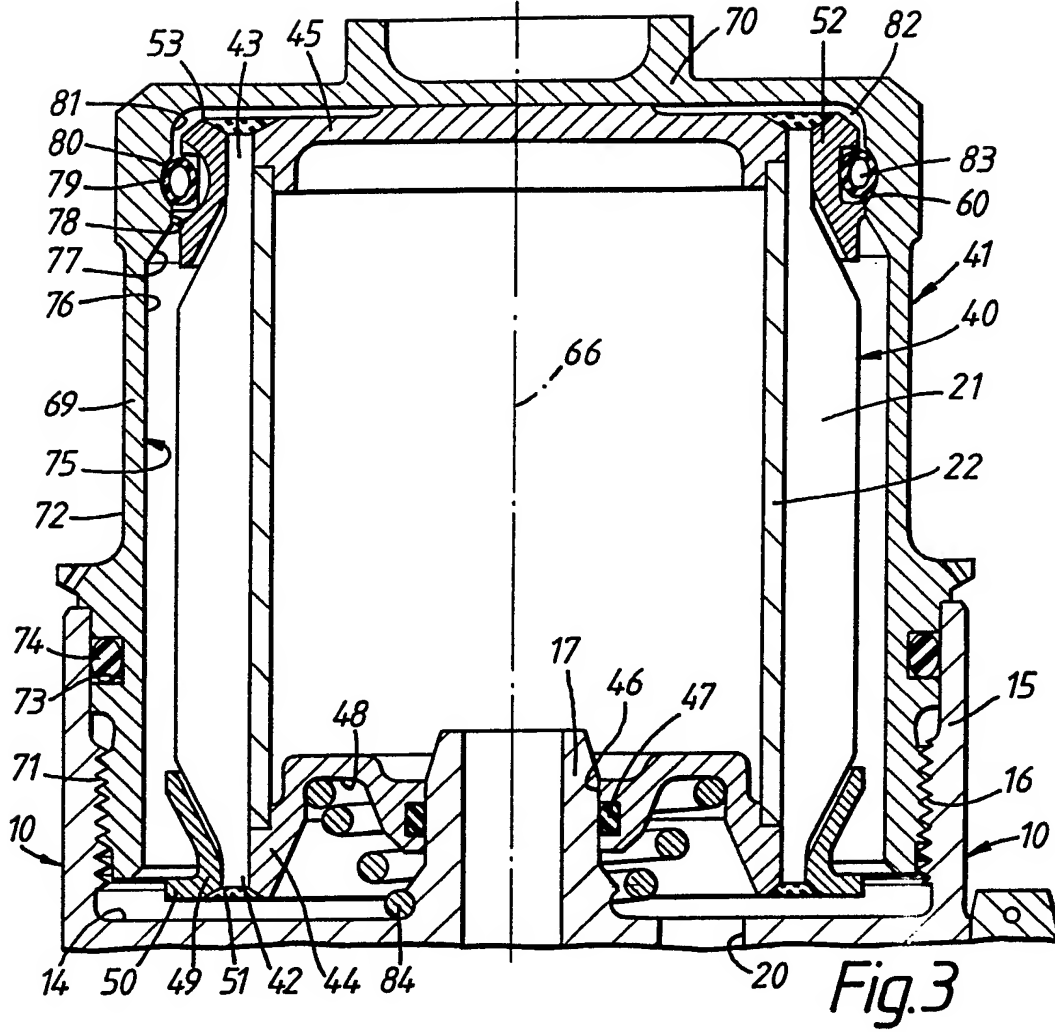


Fig. 2

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FILTER ASSEMBLIES

The invention relates to filter assemblies.

One form of filter assembly comprises a base member, a filter element mounted on the base member and a housing connected to the base member so as to enclose the filter. The housing may, for example, be generally tubular with an open end and a closed end, the open end receiving the filter element and being connected to the base member. The filter element may, for example, be formed by a generally tubular pleated filter with a fluid to be filtered being supplied to the interior of the housing, filtering through the filter and leaving via the centre of the filter material and an outlet in the base member.

The filter element is changed from time to time to prevent it becoming completely clogged with particulates removed from the fluid being filtered. To achieve this, the housing is disconnected from the base member and the filter element removed and either cleaned or replaced.

Several known filter assemblies of this type utilise connecting means which connect the filter element to the housing such that when the housing is removed from the base member during disassembly the filter element is

retained with the housing. This avoids the potential problem of contamination of the base member with particulates retained by the filter, which can occur if the housing is removed leaving the filter element on the base member and then the element is subsequently removed from the base.

GB 843 237 discloses a filter assembly in which the filter element is retained in the housing by a split ring which engages a groove in the housing at the open end. Removal of the element from the housing on disassembly requires removal of the retaining ring which most probably entails the use of a tool. GB 2 222 534 discloses a filter assembly in which the element is retained in the housing by a bayonet connection at the open end of the housing. Removal of the filter element in this case requires correct alignment of the bayonet mechanism. GB 843 990 discloses a filter assembly in which the filter element is retained in the housing by a separate retention ring provided with spring loaded balls for location in dimples at the open end of the housing. Before the element is removed from the housing the retention ring must firstly be removed from the housing.

For some applications the use of connecting means at the open end of the housing may be disadvantageous as the

fluid flow path from the base member, between the filter element and the housing to the filter medium is partly blocked by the connecting means.

EP 0 385 113 and GB 841 603 each disclose a filter assembly in which the element is connected to the housing by a screw which passes through the closed end of the housing and is received in a thread in the filter element. Removal of the filter element from the housing requires unscrewing of the retaining screw.

For many applications of filter assemblies it is desirable to be able to change the filter element as rapidly as possible when the filter element becomes clogged, and in this respect the number and complexity of operations required to disconnect the element from the housing are preferably minimised. Additionally, filter assemblies are commonly used to filter oils or other fluids which can leave a slippery coating on the assembly components. In this case it is particularly advantageous for any connecting means connecting the filter element to the housing to be easily disengageable without requiring any precise manipulation. Furthermore, in many cases the greater the degree of manipulation required to release the filter element from the housing the more likely it is that the housing may become contaminated with particulates from

the filter element.

According to a first aspect of the invention, there is provided a filter assembly comprising a base member, a filter element mounted on the base member and a housing having an open end and a closed end and being connected to the base member at the open end so as to enclose the filter element, means being provided for connecting the filter element to the housing at or towards the closed end whereby to retain the filter element with the housing when the housing is removed from the base member on disassembly, said retaining means allowing removal of the filter element from the housing by pulling the element from the housing.

According to a second aspect of the invention there is provided a filter assembly comprising a base member, a filter element mounted on the base member and a housing connected to the base member so as to enclose the filter element, the filter element and the housing being provided with respective connecting means for engagement with one another whereby to retain the filter element with the housing when the housing is removed from the base member on disassembly, said connecting means allowing disengagement of said connecting means and removal of the filter element from the housing by pulling the filter

element from the housing.

According to a third aspect of the invention there is provided a filter element for mounting on a base member connectable to a housing such that the housing encloses the filter element, the filter element being provided with connecting means for connecting the element to the housing whereby to retain the filter element with the housing when the housing is removed from the base member, said connecting means being engageable with co-operating means on the housing, the filter element being removable from the housing by pulling the filter element from the housing.

The following is a more detailed description of embodiments of the invention, by way of example, reference being made to the accompanying drawings in which:

Figure 1 is a cross-sectional view of a filter assembly including a base member, a housing and a filter element;

Figure 2 is a section on the line Z-Z of Figure 1;

Figure 3 is a cross-sectional view of an alternative filter assembly including a base member, a housing and a

filter element; and

Figure 4 is an enlarged cross-sectional view of part of the filter element shown in Figure 3.

The filter assembly shown in Figures 1 and 2 comprises a base 10, a filter element 11 carried on the base member 10 and a housing 12 connected to the base member 10 and enclosing the filter element 11.

The base 10 comprises a body 13 provided with a generally circular mounting plate 14 surrounded by an annular wall 15 having an internal thread 16. A mounting tube 17 projects from the centre of the mounting plate 14 coaxially with the common axis of the plate 14 and the wall 15.

The mounting tube 17 leads to an outlet port 18 via a pressure relief valve 19 of known kind. The body also includes an inlet port 20.

The filter element 11 is generally tubular and comprises a filter 21 formed from a pleated filter material formed into a tube. The filter 21 may be provided with a core 22 of conventional construction. One end of the filter 21 is closed by a first end cap 23 having a central aperture 24

provided with an O-ring 25. The aperture 24 and the O-ring 25 engage the mounting tube 17 to mount the filter element 17 on the base 10 and to connect the material of the filter element 11 to the outlet port 18.

A second end cap 26 is connected at the other end of the filter 21 and has a continuous end wall 27 that closes the interior of the filter 21. An annular flange 38 extends from the outer side of the end wall 27 and is coaxial with the filter 21 and the core 22. The flange 38 is provided with a pair of diametrically opposed holes 39.

As seen in both Figure 1 and Figure 2, the end cap 26 also carries a U-shaped member 28 of spring steel, which lies within the flange 38 and which is connected to the end wall 27 at the base of the U-shape, so that the limbs 29 lie on opposite sides of the axis 30 of the filter element 11 and the flange 38.

Each limb 29 carries a peg 31 projecting radially outwardly of the axis 30. Each peg 31 has a hemispherical outer end 32. In the position shown in Figures 1 and 2 each peg 31 extends through a respective one of the holes 39 so that the associated outer end 32 lies outside the flange 38.

The function of the flange 38, the U-shaped member 28 and the pegs 31 will be described below.

The housing 12 is generally cylindrical with an open end 33 and a wall 34 closing the other end. The outer surface of the housing 12 adjacent the open end 33 is provided with a screw thread which is in threaded engagement with the thread 16 on the mounting plate wall 15.

The housing end wall 34 is provided with an annular bore 35 coaxial with the axis 30, which is also the axis of the housing 12 in the position of the housing shown in the drawings. The bore 35 has at its inner end an inwardly tapering frusto-conical surface 36 leading to an annular groove 37. As an alternative to the groove 37, a pair of diametrically opposed apertures may be provided.

In use, as shown in Figure 1, the arrangement is such that the outer ends 32 of the pegs 31 engage in the annular groove 37, and the flange 38 fits closely within the bore 35. In the alternative case where a pair of apertures are provided the pegs 31 engage respective apertures. The engagement of the pegs 31 with the groove 37 (or the apertures) connects the filter element 11 to the housing 12 and so when the housing 12 is disconnected from the base 10, by unscrewing the housing 12, the filter element is removed with the housing. This prevents any possibility

of the filter element 11 remaining on the housing and causing contamination. The close fit of the flange 38 within the bore 35 prevents radial movement of the filter element 11 within the housing 12.

After the removal of the housing 12 and filter element 11 together, the filter element 11 can be removed from the housing 12 by being pulled out of the open end 33 of the housing 12 in a direction along the axis 30. A sufficient force in this direction will cause the pegs 31 to move radially inwardly, within the holes 39, against the spring action of the limbs 29 as the pegs 31 ride out of the annular groove 37 (or the apertures). The used filter element can then be cleaned or discarded.

A fresh filter element 11 can then be inserted into the housing 12 after the housing has been cleaned. The filter element 11 is inserted in such a way that the flange 38 is pushed into the bore 35. During this process the frusto-conical surface 36 engages the ends 32 of the pegs 31 and forces the pegs 31 inwardly against the spring action provided by the associated limbs 29. This position is held until the pegs 31 enter the annular groove 37 (or the apertures where such are provided) to connect the filter element 11 to the housing 12 with a snap action. If apertures are provided the filter element 11 and the housing 12 may be rotated relatively in order

to align the pegs 31 and the apertures. The housing 12 can then be threaded back on to the mounting plate wall 15 with the mounting tube 17 entering the aperture 24 in the end cap 23.

The filter element 11 may be cleaned or replaced as many times as is necessary.

It will be appreciated that a number of variations are possible. There need not be two pegs; there could only be one peg. In addition, the peg or pegs might be resiliently mounted on the housing and the groove (or aperture, or apertures) provided on the filter element.

The connection between the filter element 11 and the housing 12 need not be by pegs and a groove (or aperture(s)). Any suitable disengageable latching mechanism may be used.

An alternative filter assembly is shown in Figures 3 and 4. Parts common to Figures 1 and 2 and to Figures 3 and 4 are given the same reference numerals and are not described below in detail.

The alternative filter assembly comprises a base member 10 which is identical to the base member 10 described above

with reference to Figures 1 and 2, a filter element 40 mounted on the base member 10, and a housing 41 connected to the base member 10 and enclosing the filter element 40.

The filter element 40 is generally cylindrical and comprises a tubular filter 21 provided with a core 22 identical to the filter 21 and the core 22 of the filter element 11. First and second ends 42,43 of the filter 21 are provided with first and second end caps 44,45 respectively. The first end cap 44 has a central aperture 46 provided with an O-ring 47. The aperture 46 and the O-ring 47 are in engagement with the mounting tube 17 so as to mount the filter element 40 on the base member 10. The first end cap 44 also has an annular region 48 which is recessed into the interior of the filter element 40 and which extends around the aperture 46, between the aperture 46 and the outer periphery of the end cap 44. The function of the annular region is described below. The second end cap 45 is generally flat and closes the second end 43 of the filter 21.

The filter 21 is provided with a first collar 49 having the form of a frustro-conical wall provided at the narrow end with a radially outwardly extending flange 50. The narrow end is located adjacent the first end 42 of the filter 21 and is welded at 51 to both the filter 21 and

the outer periphery of the first end cap 44.

The filter 21 is also provided with a second collar 52 having a first end 53 at which the collar 52 is welded to both the second end of the filter 43 and to the outer periphery of the second end cap 45.

As seen most clearly in Figure 4, the second collar 52 has an outer, annular surface 54 comprising a bevelled portion 55 leading from the first end 53 to a first axially extending portion 56 which in turn leads to a first radial portion 57 extending inwardly to a second axially extending portion 58. The second axially extending portion 58 leads to a second radially extending portion 59 which is wider than the first radially extending portion 57. Thus, the first and second radially extending portions 57,59 together with the second axially extending portion 58 define a trapeziform groove 60. The second radially extending portion 59 is connected to a third radially extending portion 61 by a third axially extending portion 62 so that the second and third radial portions 59,61 together with the third axial portion 62 define a flange 63 immediately adjacent the groove 60. The third radially extending portion 61 adjoins a fourth axial portion 64 which extends to a second end 65 of the second collar 52. The fourth axially extending portion 64

lies at the same radial distance from the common axis 66 of the two collars 49,52, two end caps 44,45 and the filter 21 as the first axial portion 56.

The second collar 52 is also provided with a second groove 67, shown in longitudinal section in Figures 3 and 4. The second groove 67 extends axially, interrupting the first axial surface portion 56, the trapeziform groove 60 and the flange 63, and also extends radially into the collar 52 to an arcuate groove surface 68.

The housing 41 has an annular wall 69 which is closed at one end by an end wall 70 and open at the other end (where the housing 41 is connected to the base member 10). A screw thread 71 is provided on the outer surface 72 of the annular wall 69 towards the open end. The thread 71 is in threaded engagement with the thread 16 on the mounting plate wall 15. An annular groove 73 extends around the annular wall 69 opening at the outer surface 72 close to the screw thread 71. The groove 73 carries an O-ring 74 which provides a seal between the housing annular wall 69 and the mounting plate wall 15.

The annular wall 69 has an inner, annular surface 75 comprising a first cylindrical portion 76 extending from the open end of the housing 41 to an inclined portion 77

which leads radially inwardly to a second cylindrical portion 78. The second cylindrical portion 78 leads to a concavely arcuate portion 79 which defines a shallow, annular groove 80 and which leads to a third cylindrical portion 81 adjacent the end wall 70. The second and third cylindrical portions 78,81 have equal diameters and, together with the concavely arcuate portion 79, define an inner region 82 within the annular wall 69.

In use, as shown in Figure 3, the second end cap 45 contacts the end wall 70 and the third axial surface portion 62 lies closely adjacent the second cylindrical portion 78.

The trapeziform groove 60 is provided with a tightly fitting, hollow O-ring 83 which projects outwardly beyond the third axial surface portion 62 and is received in the shallow arcuate groove 80. This arrangement of the O-ring 83 serves to connect the filter element 40 to the housing 41 for a purpose which is described below.

The depth of the second groove 67 is such that the O-ring 83 does not contact the arcuate groove surface 68. Hence, the second groove 67 provides a passage between the O-ring 83 and the arcuate groove surface 68 by which fluid can pass between the inner region 82 and the interior region

of the housing 41 adjacent the filter 21.

A compressed helical spring 84 is located with the turns of the spring around the mounting tube 17. One end of the spring 84 is seated against the mounting plate 14 and the other end of the spring 84 is seated against the annular region 48. Hence, the spring 84 urges the second end cap 45 against the end wall 70.

During disassembly, the connection effected by the O-ring 83, and the action of the spring 84 ensure that when the housing 41 is unscrewed from the base member 10, the filter element 40 disengages from the base member 10 and is retained in position, as described above, within the housing 41.

The strength of the O-ring connection may be sufficient to resist the force urging withdrawal of the element 40 from the housing 41 resulting from the resistance to disengagement of the aperture 46 and the O-ring 47 from the mounting tube 17. In this case the spring 84 is optional. Alternatively, the O-ring connection may not be so strong - the resistance to disengagement of the aperture 46 and the O-ring 47 from the mounting tube 17 being partly overcome by the compressed helical spring 84 urging the filter element 40 into the housing 41 as the

housing 41 is unscrewed.

Once the housing 41 has been unscrewed from the base member 10 the housing 41 can be lifted away - the filter element 40 being retained in the housing 41 by the O-ring connection. In this way any possibility of contamination of the base member 10 caused by leaving the filter element 40 on the base member 10 after removal of the housing 41 is avoided.

Removal of the filter element 40 from the housing 41 can now be rapidly and easily effected by grasping the flange 50 and pulling the element 40 from the housing 41 with a force sufficient to overcome the O-ring connection. During this operation the O-ring 83 deforms, being compressed in the trapeziform groove 60 by the arcuate surface portion 79, as the shallow arcuate groove 80 moves out of alignment with the trapeziform groove 60 and the O-ring 83 disengages from the arcuate groove 80. The O-ring 83 remains compressed in the trapeziform groove 60 as the O-ring 83 comes into contact with and passes along the second cylindrical surface portion 78 until the O-ring comes into contact with the inclined surface portion 77 whereupon further withdrawal causes the O-ring 83 to resume a generally circular cross-section.

During removal of the filter element 40 from the housing 41 fluid can pass between the O-ring 83 and the arcuate groove surface 68 via the second groove 67. Hence, the second groove 67 serves to prevent the generation of a pressure differential between the inner region 82 and the remainder of the interior of the housing 41.

The filter element 40 can be washed or discarded after removal from the housing 41. The housing 41 can now, if necessary, be washed and the assembly can then be reassembled with a fresh filter element 40 as follows.

Firstly, the fresh filter element 40 is pushed into the housing 41 with the second collar 52 and second end cap 45 leading. If the filter element 40 is not centralised within the housing 41 as the second collar 52 reaches the inclined surface portion 77 the bevelled portion 55 contacts the inclined surface portion 77 causing the second collar 52 to be guided, on further insertion, into the inner region 82.

As the second collar 52 moves into the inner region 82 the hollow O-ring 83 comes into contact with the inclined surface portion 77. Further insertion causes the O-ring 83 to deform as it is compressed in the trapeziform groove 60 by the inclined surface portion 77. The O-ring 83

remains deformed as it comes into contact with and passes along the second cylindrical surface portion 78 until the O-ring 83 comes into alignment with the shallow arcuate groove 80 when the O-ring 83 regains a generally circular cross-section being received by the shallow arcuate groove 80. The filter element 40 is now in position within the housing 41 and connected to the housing 41 by the O-ring 83 as described above.

The second groove 67 provides a fluid flowpath between the O-ring 83 and the arcuate groove surface 68 throughout the insertion of the filter element 40 into the housing 41 thereby preventing the generation of a pressure differential between the inner region 82 and the remainder of the interior of the housing 41.

The helical spring 84 can now be placed around the mounting tube 17 before the housing 41 and the filter element 40 are connected to the base member 10 by threading together threads 71 and 16. During this operation the aperture 46 and the O-ring 47 engage the mounting tube 17, the housing O-ring 74 seals against the annular wall 15 and the spring 84 seats against the annular region 48 and is compressed as the first end cap 44 approximates the mounting plate 14.

The filter assembly is now ready to filter fluids.

Alternatively, the assembly can be assembled by first placing the spring 84 around the mounting tube 17 and then mounting the fresh filter element 40 on the base member 10 so that the aperture 46 and the O-ring 47 engage the end of the mounting tube 17 and the spring 84 seats in the annular region 48. The housing 41 can then be threaded into the base member 10. During this operation the second collar 52 enters the inner region 82 and the hollow O-ring 83 engages the shallow arcuate groove 80 as described above. Once this has occurred further threading pushes the first end cap 44 further onto the mounting tube 17 and compresses the spring 84.

The filter assembly need not be as described above with reference to Figures 1 and 2 or Figures 3 and 4. Additionally, the filter assembly need not be orientated as described above with reference to Figures 1 to 4. It may be used with any suitable arrangement of base, filter element and housing. The filter element need not be as described above, it could be any suitable filter element.

CLAIMS

1. A filter assembly comprising a base member, a filter element mounted on the base member and a housing having an open end and a closed end and being connected to the base member at the open end so as to enclose the filter element, means being provided for connecting the filter element to the housing at or towards the closed end whereby to retain the filter element with the housing when the housing is removed from the base member on disassembly, said retaining means allowing removal of the filter element from the housing by pulling the element from the housing.

2. A filter assembly according to claim 1, wherein said retaining means comprises connecting means provided on the filter element and connecting means provided on the housing at or towards the closed end, said filter connecting means and said housing connecting means being engageable with one another to connect the filter element to the housing and being disengagable on said removal of the filter element from the housing.

3. A filter assembly comprising a base member, a filter element mounted on the base member and a housing connected to the base member so as to enclose the filter element,

the filter element and the housing being provided with respective connecting means for engagement with one another whereby to retain the filter element with the housing when the housing is removed from the base member on disassembly, said connecting means allowing disengagement of said connecting means and removal of the filter element from the housing by pulling the filter element from the housing.

4. A filter assembly according to claim 3 wherein the housing has an open end and a closed end, said connection between the housing and the base member being at the open end, and said housing connecting means being provided at or towards the closed end.

5. A filter assembly according to any one of claims 2 to 4, wherein the filter connecting means is re-engageable with the housing connecting means by pushing the filter element into the housing.

6. An assembly according to any one of claims 2 to 5, wherein the filter element connecting means and the housing connecting means are engageable with a snap-action.

7. An assembly according to any one of claims 2 to 6, wherein the housing is cylindrical and the filter element

is generally tubular and lies coaxial with the housing, one connecting means comprising a peg which projects in a radial direction relative to said coaxial axis, the other connecting means comprising means for receiving said peg, axial movement of the filter element into the housing causing relative radial movement between the peg and the receiving means until the peg engages in the receiving means.

8. An assembly according to claim 7, wherein said one connecting means comprises two pegs each engageable in the receiving means.

9. An assembly according to claim 7 or claim 8, wherein the or each peg is carried on the filter element and the receiving means is formed on the housing.

10. An assembly according to claim 9, wherein the or each peg is mounted by a spring, the housing including means for moving the or each peg radially against the associated spring as the filter element is moved axially into the housing, the or each spring urging the associated peg into the receiving means as the peg is aligned with said receiving means.

11. An assembly according to claim 10 when claim 9 is

dependent on claim 8, wherein the filter element carries at one end a U-shaped spring attached to the filter element at the base of said U-shape with the limbs arranged on diametrically opposite sides of the axis of said filter element, each limb carrying a respective peg and providing said spring for said peg.

12. An assembly according to claim 10 when claim 9 is dependent on claim 8, or claim 11, wherein said housing has, at said closed second end, a cylindrical bore coaxial with the axis of the housing, the wall including a groove providing said receiving means for receipt of pegs.

13. An assembly according to claim 10 when claim 9 is dependent on claim 8, or claim 11, wherein the housing has, at said closed second end, a cylindrical bore coaxial with the axis of the housing, the wall including two diametrically opposed radially extending apertures providing said receiving means for receipt of respective pegs.

14. An assembly according to claim 12 or claim 13, wherein said wall includes a frusto-conical portion engaged by said pegs as the filter element is inserted into the housing to move said pegs radially inwardly against said springs until the pegs are aligned with the

receiving means under the action of the springs.

15. A filter assembly according to any one of claims 2 to 5, wherein one of the connecting means comprises an O-ring seated in and extending out of a first annular groove and the other one of the connecting means comprises a second annular groove, the O-ring extending into the second groove so as to effect said engagement.

16. A filter assembly according to claim 15, wherein means are provided for allowing the passage of fluid past the O-ring.

17. A filter assembly according to claim 16, wherein said passage means comprise an axially extending third groove that interrupts the first groove or the second groove whereby to provide a fluid flow path around the O-ring.

18. A filter assembly according to claim 16 or claim 17, wherein the first groove is provided in an external surface of the filter element and the second groove is provided in an internal surface of the housing.

19. A filter assembly according to claim 18, wherein the internal housing surface includes a portion adjacent said

second groove which compresses the O-ring in the first groove during insertion of the filter element into the housing before the O-ring enters the second groove.

20. A filter assembly according to claim 18 or claim 19, wherein the filter element includes a generally cylindrical filter medium, an annular collar extending around the filter medium at one end thereof, said first groove being provided in said collar.

21. A filter assembly according to any preceding claim, further comprising a spring located between the base member and the filter element and urging the filter element into the housing.

22. A filter assembly substantially as hereinbefore described with reference to the accompanying drawings.

23. A filter element for mounting on a base member connectable to a housing such that the housing encloses the filter, the filter element being provided with connecting means for connecting the element to the housing whereby to retain the filter element with the housing when the housing is removed from the base member, said connecting means being engageable with co-operating means on the housing, the filter element being removable from

the housing by pulling the filter element from the housing.

24. A filter element according to claim 23, wherein the filter element is connectable to the housing by the connecting means by pushing the filter element into the housing.

25. A filter element substantially as hereinbefore described with reference to the accompanying drawings.



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Claims searched: 1-25

Examiner: Dr. A.J.Rudge  
Date of search: 20 September 1995

The Patent Office  
Cardiff Road  
Newport  
Gwent NP9 1RH

Switchboard  
01633-814000

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.N): B1D(DNED,DNQA,DNQX,DNRE,DNRF);B1T(TNED,TNRB)  
Int Cl (Ed.6): B01D-035/14;35/30;35/30D  
Other: ONLINE DATABASES:WPI,CLAIMS,EDOC,WPIL

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB2222534A (Process Scientific) - see abstract line 3	1 at least
A	GB1604832 (Fram Corp.) - see whole document	1-25
X	GB 843990 (Parmatic) - see page 2, lines 127 et seq	1 at least
X	GB 843237 (Parmatic) - see page 2, lines 27 et seq	"
X	GB 841603 (Parmatic) - see page 3, lines 84 et seq	"

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
		E	Patent document published on or after, but with priority date earlier than, the filing date of this application.
&	Member of the same patent family		

**DERWENT-ACC-NO:** 1996-032346

**DERWENT-WEEK:** 199842

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**TITLE:** Filter assembly having filter element which is retained within housing when it is removed from its base but can then be pulled from the housing easily for changing, the top of the filter element and closed end of the housing having engageable and disengageable connecting means

**INVENTOR:** CASSIDY R F; SHORT R E

**PATENT-ASSIGNEE:** PALL CORP[PALL]

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**PATENT-FAMILY:**

<b>PUB-NO</b>	<b>PUB-DATE</b>	<b>LANGUAGE</b>
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IT 1276775 B	November 3, 1997	IT

**APPLICATION-DATA:**

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DE 19523239A1	N/A	1995DE-1023239	June 27, 1995
FR 2721530A1	N/A	1995FR-007710	June 27, 1995

**INT-CL-CURRENT:**

<b>TYPE</b>	<b>IPC DATE</b>
CIPS	B01D29/21 20060101
CIPS	B01D35/14 20060101

**ABSTRACTED-PUB-NO:** GB 2290486 A**BASIC-ABSTRACT:**

Filter assembly has a filter element (11) mounted on a base (10) and enclosed by a housing (12) having an open end connected to the base. The filter element is connected to the housing at or

towards a closed end so that it is retained within the housing when it is removed from the base on disassembly. The retaining means (29,31,37) allows removal of the filter element from the housing by pulling it.

The retaining means comprises connecting means provided on both the filter element and on the housing at or towards its closed end, which are engageable with and disengageable from each other. The filter connecting means is re-engageable with the housing connecting means by pushing the filter element into the housing. The two connecting means are engageable with a snap action.

USE - Filter assemblies are used to filter oils or other fluids which can leave a slippery coating on the assembly components.

ADVANTAGE - Since the filter element retaining means is at the closed end of the housing, it does not restrict the fluid flow path from the base. The element is easily disengageable for rapid changing without any precise manipulation. The simplicity of the connection makes it unlikely for the housing to become contaminated with particulates.

**CHOSEN-DRAWING:** Dwg.1/4

**TITLE-TERMS:** FILTER ASSEMBLE ELEMENT RETAIN  
HOUSING REMOVE BASE CAN PULL EASY  
CHANGE TOP CLOSE END ENGAGE  
DISENGAGE CONNECT

**DERWENT-CLASS:** J01

**CPI-CODES:** J01-F02D;

**SECONDARY-ACC-NO:**

**CPI Secondary Accession Numbers:** 1996-011124